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ABSTRACT

This paper examines the phenomenon of final consonant deletion in clusters which do not agree in voicing and compares this phenomenon with clusters sharing the voicing feature. The speech studied is that of Puerto Rican and black Harlem teenagers. The data reported here refutes many of Bailey's (1972) claims. Clusters where voicing is not shared are found to simplify differently than shared voicing clusters. Clusters with "l" as the first member are found to behave differently than clusters beginning with a nasal, and nasal clusters behave differently depending on the final consonant. Certain of these clusters also behave differently from previously studied consonant cluster simplification, as well as final postvocalic consonant deletion. That all of these deletion phenomena show different frequencies of simplification, as well as different constraints on simplification, indicates that variability rules for consonant cluster simplification must be further refined and new rules added. Such refinements and new rules are proposed in the present paper, and the implications of these new rules on the ordering of all deletion phenomena are discussed. (Author/AM)

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REAPPRAISAL OF THE VOICING CONSTRAINT IN CONSONANT CLUSTER SIMPLIFICATION

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REAPPRAISAL OF THE VOICING CONSTRAINT IN CONSONANT CLUSTER SIMPLIFICATION

Variability studies of consonant cluster simplification have in general been limited to consonant clusters where both members are either voiced or voiceless. However, clusters whose consonants do not agree in voicing have not been investigated and it was not known in what way these clusters differed from clusters having the same voicing feature. It was not possible therefore to know whether the voicing constraint in consonant cluster simplification rules was well-motivated or not. C.-J. N. Bailey (in Fasold 1972) presents several hypotheses concerning the behavior of clusters with and without a shared voicing feature, specifically clusters beginning with l and nasals, but without any data to verify the hypotheses.

This paper examines the phenomenon of final consonant deletion in clusters which do not agree in voicing and compares this phenomenon with clusters sharing the voicing feature. Many of Bailey's claims are not substantiated by the data reported herein. Clusters where voicing is not shared are found to simplify differently than shared voicing clusters. Clusters with l as the first member are found to behave differently than clusters beginning with a nasal, and nasal clusters behave differently depending on the final consonant. Certain of these clusters also behave differently from previously studied consonant cluster simplification, as well as final postvocalic consonant deletion.

That all of these deletion phenomena show different frequencies of simplification, as well as different constraints on simplification, indicates that variability rules for consonant cluster simplification must be further refined and new rules added. Such refinements and new rules are proposed in the present paper, and the implications of these new rules on the ordering of all deletion phenomena are discussed.

REAPPRAISAL OF THE VOICING CONSTRAINT IN CONSONANT CLUSTER SIMPLIFICATION

Marie Shiels-Djouadi

Introduction

The loss of the final consonant in a cluster, herein referred to as consonant cluster simplification, has been treated in two different ways in variability literature: as part of the general phenomenon of consonant deletion in word-final position in which case clusters delete in a manner similar to single consonants following a vowel (Labov et al 1968, Fasold 1972) or as a phenomenon distinct from deletion of a single consonant after a vowel (Wolfram 1969, 1973, Shiels 1972). Wolfram has held that consonant cluster simplification is different from single final consonant deletion, not only because the frequencies of both are different, but more importantly, the constraints on each are different. He has, however, limited his consideration to those clusters where both consonants are either voiced or voiceless, and, until recently(Shiels 1972, Fasold 1974, Freeman 1975), little examination has been done to determine whether clusters with one voiced and one voiceless member vary in the same way as clusters with shared voicing.

Fasold (1972:61ff) cites certain arguments by Bailey that clusters not agreeing in voicing operate differently than other clusters. Bailey's predictions

can be summarized under four points:

1) nt will not show deletion of t because the nasal is realized in the vowel and therefore t is not a member of a consonant cluster, but rather a postvocalic consonant. Presumably t deletion after nasals will be the same as t deletion after vowels, for those speakers who realize the nasal uniquely in the vowel.

2) nd deletion is the same as consonant cluster simplification, since n retains its consonantal characteristics and clusters with d.

lt and ld sequences show deletion depending on the preceding vowel.

3) ld and lt in words like build and built are often not consonaont clusters. Rather l is part of the syllabic nucleus and final t and d delete under the same conditions as t amd d following a vowel. It is not clear what effects the change from consonantal l to nuclear l.

4) in words like bolt the lateral is consonantal but is not phonologically clustered with t, and final t will not delete.

This paper studies final clusters of two consonants where the consonants do not share voicing, specifically where the first consonant is a nasal or lateral and the second consonant is voiceless, with reference to Bailey's hypotheses.[1] Frequencies of simplification and constraints

[1]Presumably Bailey's hypotheses include not only final t and d, but all voiceless and voiced obstruents.

on simplification for these clusters are compared to the processes of final stop deletion and simplification of clusters with shared voicing. On the basis of that comparison, new rules are proposed, refinement of previous rules are suggested, and some questions regarding variability theory and methodology are asked.

The speech here studied is that of Puerto Rican and black teenagers in Harlem, and is the same speech studied by Wolfram (1973) and Shiels (1972). The groups of speakers represented are: Puerto Ricans (hereafter abbreviated as PR), who acquired English as a second language when they began school and whose contacts are predominantly other Puerto Ricans; Puerto Ricans who acquired English as a second language when they began school but whose contacts are predominantly black (hereafter abbreviated PR+); and American blacks (hereafter abbreviated Bl). The interviews, on which the analyses are based, were informal. Further information on the interviews, as well as on the background of the informants, can be found in Wolfram et al (1971) and Wolfram (1973).

Clusters with nasals

Although underlying n was the most frequent nasal occurring, any nasal, followed by any voiced or voiceless consonant was tabulated. Two kinds of clusters were studied: those with a voiced second member and those with a voiceless.

Several variants occurred: with a voiceless consonant VNC_o, VNØ, VC_o, $V\tilde{n}$, Vn?, $\tilde{V}C_o$, $\tilde{V}Ø$; with a voiced consonant VNC_v, VNØ, VNd_o, $\tilde{V}C_v$. Since the present study is concerned with the presence or absence of the final consonant, variants showing any vestige of the final consonant were classified as final consonant presence, e.g. $V\tilde{n}$, Vn?, so that variants showing absence were two, for both kinds of clusters: VNØ and VØ.

Nasal clusters showed significantly more simplification when the second consonant was voiced. These are the frequencies of simplification:

	Bl		PR+		PR	
absence of C_o/ all potential occurrences of NC_o	23/177	13%	12/71	16.9%	113/491	23%
absence of C_v/ all potential occurrences of NC_v	18/21	85.7%	17/23	73.9%	65/105	61.9%

These clusters appear to operate differently, at least in terms of simplification frequency.

Only two phenomena appear to be constraints on simplification of NC_v clusters: simplification is favored if the cluster is bimorphemic, and if the following segment is not a vowel. These constraints and their hierarchical ordering must be tentatively postulated because the number of monomorphemic NC_v clusters is so small. Only nine of 105 examples of NC_v clusters in PR speech

monomorphemic, and even fewer cases were found for the other two groups of speakers. Given further monomorphemic examples, the constraints might be otherwise. All bimorphemic clusters, with one exception, were past, so that it is not possible to test further the nature of the bimorphemic cluster. Stress was not found to be a factor in simplification.

The following order of constraints appears:

Table 1. Ordering of constraints on NC_V simplification. Following pause effected simplification at a frequency similar to that of consonants, rather than that of vowels, hence the designation -V includes both pause and consonant.

Three constraints appear to be operative on NC_o clusters: simplification is favored if the cluster is bimorphemic, or if the syllable containing the cluster is unstressed, or if the following segment is a consonant. While each of these constraints effects simplification, none of them are hierarchically ordered in relation to the others. The effects on simplification are the following:

Bl		PR +		PR	
Mn	Bm	Mn	Bm	Mn	Bm
14/141 9.9%	9/36 25%	10/66 15.1%	2/5 40%	74/422 17.5%	36/69 56.5%
/	⌣	/	⌣	/	⌣
12/147 8.1%	11/30 36.6%	9/60 15%	3/11 27.3%	72/420 17.1%	41/71 57.7%
-C	C	-C	C	-C	C
12/115 10.4%	11/62 17.7%	7/52 13.5%	5/19 26.3%	45/296 15.2%	68/195 34.9%

The feature -C includes both a following vowel and a following pause, since the simplification effected by pause is closer in frequency to that of vowels than that effected by consonants.

Clusters with l

Clusters with l as the first member were studied in two groups, depending on whether the final consonant was voiced or voiceless (e.g. killed, gold, vs. built, bolt). Three variants occurred for both kinds of clusters: lC, V^uC, and lØ. A fourth variant occurred for each kind

of cluster: $V^{u}\emptyset$ where the potential final consonant was voiced, and VC where the potential final consonant was voiceless. Tabulations for the presence or absence of the final consonant show $1C_o$ clusters almost invariably intact, and considerable simplification for $1C_v$ clusters.

	Bl		PR+		PR	
absence of C_o/ total potential						
$1C_o$	0/31	0%	0/24	0%	2/95	2.1%
absence of C_v/ total potential						
$1C_v$	40/54	74%	42/63	66.6%	81/151	53.6%

Bailey suggested that the vowels i (e.g. build, built) and o (e.g. bolt) would show different frequencies of simplification, although it was not clear in his predictions whether frontness (vs. backness) or high (vs. low) was the effective feature. The only vowels in the present data with a large number of potential occurrences were i,iy and o,ow. There were four occurrences of ey,e which were evenly divided in simplification, and four occurrences of uw,u for which there was no simplification.[2] Since the difference between iy,i and ow,o is both height and fronting, the question of which feature effects simplification is moot, but the difference in cluster reduction is significant. Using total potential occurrences following only these four vowels, the following simplification occurs:

[2]Occurrences of ay (14 in number) were discounted since the offglide for this diphthong varied from high y to mid-central ə (cf. Shiels 1972). Instances of a central vowel were also discounted since no effort was made in transcription to discriminate a high central from a low central vowel. These vocalic nuclei will henceforth be omitted from discussion.

	Bl		PR+		PR	
lØ after iy,i/ lC$_v$ after iy,i, ow,o	4/46	8.7%	2/39	5.1%	15/140	10.7%
lØ after ow,o/ lC$_v$ afteriy,i, ow,o	29/46	63%	23/39	59%	64/140	45.7%

Because uw,u shows no simplification in any occurrence, and thus approximates iy,i, it will be assumed that the vocalic feature effective in simplification is +high (including iy,i,uw,u) which shows the following:

	Bl		PR+		PR	
+highV lØ/VlC$_v$	4/48	8.3%	2/39	5.1%	15/146	10.3%
-highV lØ/VlC$_v$	29/48	60.4%	23/39	59%	64/146	43.4%

It is clear that a -high vowel encourages cluster simplification, and this feature is a first order constraint. In addition, the final consonant of the cluster is more frequently absent if the cluster is monomorphemic, and if the following segment is nonvocalic, i.e. a consonant or a pause. However, while both of these constraints clearly affect the cluster, they cannot be hierarchically ordered relative to one another. Both possibilities of ordering are shown below:

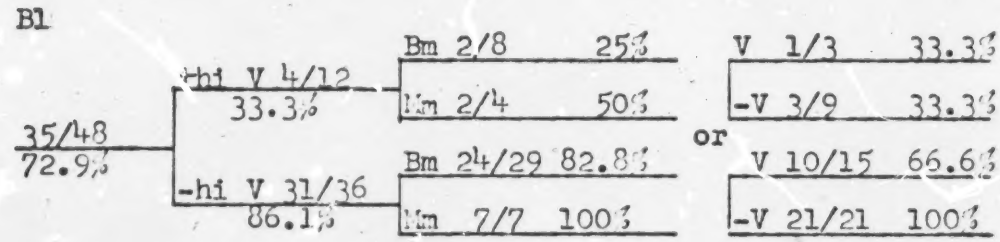

Table 2. Ordering of constraints on $1C_V$ simplification.

l and nasal clusters compared with other deletion phenomena

When clusters beginning with a nasal or l are compared with the deletion of single final voiced and voiceless consonants, and with simplification of consonant clusters having the same voicing feature, but excluding clusters with l and nasals, the following gradatum emerges:

	Bl	PR+	PR
$1C_O$	0	0	2.2%
+hiV $1C_V$	8.3%	5.1%	10.3%
NC_O	13%	16.9%	23%
VC_O (Wolfram 1973:130)[3]	14.8%	27.2%	24.4%
VC_V (Wolfram 1973:131)	30.5%	53.6%	43.9%

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[3]The figures given here for VC_O and VC_V represent the combined total of Wolfram's figures.

	B1	PR+	PR
-hiV $1C_v$	60.4%	59%	43.4%
C_oC_o or C_vC_v (Shiels 1972)[4]	72%	62%	67%
NC_v	85.7%	73.9%	61.9%

Table 3. Percentages of simplification for consonant clusters and final stops.

This table provides data necessary to consider Bailey's hypotheses discussed earlier:

1) nt, and presumably other clusters of nasal plus voiceless obstruent, were expected to show the same deletion as a voiceless consonant after a vowel. In general, this is true. However, contrary to Bailey's prediction, the nasal usually keeps its consonantal realization and is rarely completely assimilated to the preceding vowel. An examination of the frequencies for each variants of NC_o shows a relatively small percentage of cases where the nasal is realized uniquely in the vowel:

	B1	PR+	PR
VC/total potential occurrences of VNC_o	0	1/492 .2%	7/74 9.4%
VØ/total potential occurrences of VNC_o	0	4/492 .8%	2/74 2.7%

[4]Figures adjusted to omit clusters with either l or a nasal as the first member of the cluster.

2) nd, and presumably other clusters of a nasal followed by a voiced obstruent, were predicted to have the same frequency of simplification as other consonant clusters with shared voicing. NC_V clusters, however, show considerably more simplification for B1 and PR+ speakers, and less simplification for PR speakers.

3) ld and lt clusters in words like build and built were predicted to show deletion like d and t after vowels. This hypothesis is not borne out by the data. First of all, postvocalic t and d show different frequencies of deletion according to Wolfram's (1973) analysis. Furthermore, lC_o clusters remain almost invariably intact as clusters, no matter what the environment. Finally, lC_V clusters following a high vowel show some frequency of simplification, but less than voiced and voiceless consonants following a vowel.

4) lt clusters in words like bolt were expected to show no deletion because the lateral is consonantal and does not cluster. The data show no deletion for any lt cluster, as Bailey predicted.

Finally, lC_V clusters following non-high vowels show a significantly high frequency of deletion. In addition Wolfram's contention that clusters which share voicing

operate differently from clusters not sharing voicing seems to be supported.

Comparison of constraints

Wolfram has accounted for final t and d deletion in a single rule since both show the same constraints on deletion. The constraints are five, including the second order constraint of voicing which accounts for greater deletion of voiced d than unvoiced t. Following the constraints given by Wolfram, deletion is more frequent if: the following segment is a nonvowel (i.e. consonant or pause), the final stop is voiced d, the final syllable of the word is unstressed, the final stop does not represent a separate morpheme, and, when the final stop is a separate morpheme, it is also non-past (Wolfram 1973: 122, 125). The ordering of constraints for all the phenomena discussed in this paper, including Wolfram's study of final d and t, may be summarized as follows:

	1	2	3	4	5
$1C_0$	NONE				
$1C_V$	-hi V	Mm, or -V			
NC_0	Bm, or C, or -stress				
NC_V	Bm	-V			
CC (Shiels 1972)	C	-V	Mm		
VC_0-VC_V (Wolfram 1973)	-V	d	-stress	Mm	non-PAST

Table 4. Comparison of constraints on cluster simplification and final stop deletion.

A fourth order constraint of the feature [cont] was previously identified for clusters sharing voicing (Shiels 1972) but is here omitted since, when clusters with l or a nasal are abstracted, continuancy is no longer a constraint.

There are some similarities in constraints. The vocalicity or consonantality of the following segment appears as a high order constraint for all processes, but significantly, it is not a first order constraint for NC_V as it is for CC and VC. On the other hand, the constraint of bimorphemicity is a first order constraint for NC_V, but a third order constraint on CC and on VC, if one discounts the voicing feature necessitated by collapsing final t and d deletion into one rule. Stress is a constraint on NC_O and VC but after having been tested was not found to be a constraint in the other processes. In addition, there are two constraints identified here of limited generality: the voicing feature in VC deletion, and the height of the vowel in lC_V clusters. Finally, while most of the constraints are hierarchically ordered, NC_O clusters have unordered constraints, and lC_V has two unordered second order constraints. In general, therefore, not only do these phenomena show different frequencies of deletion or simplification, but further, the constraints on deletion do not always match for each process. When constraints are similar, furthermore, they do not show the same hierarchical ordering.

Variable rules

The question then is whether these processes are distinct and therefore necessitate separate rules to account for them. Wolfram first discussed this question (1973a) when considering whether final t,d deletion could be considered part of the same process as consonant cluster simplification for clusters sharing voicing. He concluded that, "in the absence of other types of formal motivation to separate them", the different hierarchy of constraints indicates the rules should be kept distinct. A second motivation for considering processes distinct from each other is difference in constraint effects. This is one of the reasons for Wolfram's considering ARE copula Absence distinct from r desulcalization (Wolfram 1973a).

For the present data these processes show both different hierarchies of constraints and different constraint effects. Therefore it would seem that, in the absence of motivations to the contrary, these processes should be considered distinct from each other, and should be accounted for by separate rules.

At least three new rules must be written then to account for: 1) the variable deletion of final voiced obstruents following l, 2) the variable deletion of final voiced obstruents following nasals, and 3) the variable deletion of final voiceless obstruents following nasals. No rule need be written for voiceless obstruents following l since the cluster remains intact. In addition, the consonant cluster rule must be rewritten to account for clusters

without l and nasals, omitting the fourth constraint of continuancy. These rules are tentatively proposed as follows:

lC_V simplification:

$$\begin{bmatrix} C \\ -son \\ +voi \end{bmatrix} \text{----}> (\emptyset) / \begin{bmatrix} V \\ A\text{-hi} \end{bmatrix} \begin{bmatrix} C \\ -nas \\ +ant \\ +son \end{bmatrix} \beta \begin{Bmatrix} -\# ____ \\ ____ \end{Bmatrix} \#\# \text{-V}$$

This rule excludes nasals, r, and l as the second member of the cluster, and further, provides for the deletion of the second member of the cluster only after l. It does not therefore provide for deletion of the final consonant when l is vocalized and thus becomes part of the syllabic nucleus.

NC_V simplification:

$$\begin{bmatrix} C \\ -son \\ +voi \end{bmatrix} \text{----}> (\emptyset) / [+nas]\ A + \# ____ \#\# \beta\text{-V}$$

This rule is written to account for the variable deletion of voiced consonants following a nasalized segment, whether that segment be a consonant or a vowel. Another rule is necessary to account for assimilation of a nasal consonant to the preceding vowel, but such a rule demands further study of the nasalization process.

NC_o simplification:

$$\begin{bmatrix} C \\ -voi \end{bmatrix} \text{----}> (\emptyset) / \begin{bmatrix} V \\ A\text{-stress} \end{bmatrix} \begin{bmatrix} C \\ +nas \end{bmatrix} A + \# ____ \#\# A\,C$$

This rule accounts for the three unordered constraints (here all marked as first-order) on NC_o simplification.

Simplification of consonant clusters agreeing in voicing:

$$\begin{bmatrix} C \\ \alpha voi \end{bmatrix} \text{----} > (\emptyset) / \begin{bmatrix} C \\ -son \\ \alpha voi \end{bmatrix} \begin{bmatrix} -\# \end{bmatrix} ____ \#\# \begin{Bmatrix} A\,C \\ B\,[-seg] \end{Bmatrix}$$

This rule is written to exclude r, l, and nasals as the first consonant of the cluster, and represents a refinement of the rule in Shiels (1972).

The rule Wolfram has written for final stop deletion is the following:

Final stop deletion (Wolfram 1973: 146)

$$\begin{bmatrix} -voc \\ -cont \\ +ant \\ +cor \\ -nas \end{bmatrix} \text{-----} > (\emptyset) / \begin{bmatrix} V \\ -stress \end{bmatrix} \Delta - \# \begin{bmatrix} \beta +voice \\ -PAST \end{bmatrix} \#\# A - V$$

The rules proposed above are incomplete in that they do not account for voiced consonant deletion when l is vocalized, nor for the vocalization of nasals. However, before these can be specified, further investigation is necessary to determine the conditions under which these processes occur.

How these rules should be ordered relative to one another is not clear. There are some possibilities however which can be tested by further analysis of the present data. First, there may be some motivation for ordering the final stop deletion rule after the cluster simplification

rules if sufficient examples can be found of clusters where both members, or all members, of the cluster are deleted. There appear to be few, if any, cases of this in the speech studied here. If there are cases of this process, then the feeding relationship between cluster simplification rules and the final stop deletion rule may necessitate a variable input to the final stop deletion rule (cf. Wolfram 1973a).

A second possibility for investigation is the vocalization of l and nasals. Environments and constraints which provoke the assimilation of these segments to the syllabic nucleus must be identified and the ordered relationship between these processes and cluster simplification must be discovered. In addition, the relationship between l and nasal vocalization and final stop deletion will have to be delineated.

A third area of study is the application of the devoicing rule (Wolfram 1973) to clusters whose last member is voiced. If the devoicing rule is found to apply, then it must also be determined whether these devoiced clusters undergo simplification following the same constraints and constraint effects as clusters whose final member is voiceless. Until these three areas are studied, it does not seem possible to determine the ordering of the rules here proposed.

Conclusion

The present paper seems to have complicated rather than clarified the final consonant deletion picture. It had been suggested by Wolfram that consonant clusters not having the same voicing feature for both consonants operate differently than clusters which share voicing. Insofar as clusters with l or a nasal as the first consonant of a clusters and with voiceless obstruents as the second member of the cluster are representative of clusters not sharing voicing, then it can be said that the present study supports Wolfram's hypothesis.

It had been suggested by Bailey (Fasold 1972) that under certain circumstances clusters with l and nasals as the first member simplify similarly to final stops following a vowel. This approximates the facts only for NC_O clusters since they show deletion rates similar to voiceless stops following a vowel. However, even these two processes do not share the same constraints, and what constraints they do share are not similarly ordered.

Finally it has been suggested here that simplification of NC_V, NC_O, lC_V, CC, and the deletion of final post-vocalic stops, are all separate processes and should be accounted for by different rules.

Questions of a theoretical or methodological nature have become apparent during the course of this investigation. One such question concerns the general applicability of constraints on variability and the effects of these constraints.

In the present data NC_V clusters show significantly more simplification than consonant clusters with shared voicing for B1 and PR+ speakers, but less simplification for PR speakers. A similar phenomenon occurs for PR speakers for the second order constraints on $1C_V$ simplification. This may be an artifact of the influence of Puerto Rican Spanish on these speakers. However, a similar problem arises with PR+ speakers who show significantly less difference in simplification for $1C_V$ clusters after non-high vowels than the B1 and PR speakers. This too may be explained as the result of the convergent processes of Puerto Rican Spanish influence and black English influence (Wolfram 1973). This indicates that the applicability of variable rules or certain constraints with variable rules should be indexed according to speaker group. Further study must identify the phonological factors responsible for some processes being realized differently by certain groups.

A second problem to be considered is the effect of a following pause on the deletion of a segment. In some cases, pause was found to be as effective a constraint as a following vowel or consonant, as in simplification of consonant clusters with shared voicing where the weighted effect of the pause motivated the specification of two separate constraints, V/-V and C/-C. In other cases, however, pause was found to be similar to a following vowel in its effect on simplification, e.g. in NC_0 clusters. On the other hand pause was found to be similar to a following consonant in NC_V and lC_V clusters. The reason for this on phonological grounds is not immediately apparent and leads to the suspicion that there may be some other underlying factor not yet discovered in these cases.

A third problem concerns the effect of morpheme boundary on simplification or deletion. In the case of final stops following a vowel, deletion is favored if the stop does NOT occur across morpheme boundary. The same is true of lC_V clusters and clusters with shared voicing. The effect is quite the opposite for nasal clusters where simplification IS favored across morpheme boundary. This may be related to the nasalization of the preceding vowel, but then one would expect at least the same effect where l is vocalized.

Finally, and perhaps most seriously, the fact that each of these clusters shows different constraints seems

to be, in many cases, phonologically unexpected. Does this element of surprise indicate that variable analysis can be instrumental in elucidating certain properties of similar sound segments which were not previously apparent, or does this element of surprise indicate some way in which variability theory is missing the mark by erroneous analysis?

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